NON-PUBLIC?: N
ACCESSION #: 9308090225
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Zion Unit 1 PAGE: 1 OF 3

DOCKET NUMBER: 05000295

TITLE: Unit 1 Reactor Trip due to a shorted Terminal on a Loop Isolation Valve Limit Switch
EVENT DATE: 07/07/93 LER #: 93-007-00 REPORT DATE: 08/03/93

OTHER FACILITIES INVOLVED: Zion Unit 2 DOCKET NO: 05000304

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Arthur R. Campos, System Engineering TELEPHONE: (708) 746-2084

Staff ext. 2146

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JE COMPONENT: 33 MANUFACTURER: N007
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On July 7, 1993 at 0851 during the performance of Periodic Test (PT)-5, "Reactor Protection Logic Testing". on train A, the Reactor Protection test panel pushbutton was depressed, inadvertently causing the 1B Reactor Coolant Pump (RCP) AB! breaker to trip open and Unit 1 Reactor to trip.

The cause of the Unit 1 Reactor Trip was component failure. Troubleshooting identified that the stem mounted limit switch for Loop Stop Isolation Valve (LSIV) 1MOV-RC8001D had a shorted lug on the limit switch contact. The safety significance of this event was minimal.

Corrective actions include repairing the shorted lug, verifying the state of each LSIV relay for both units, and successfully reperforming PT-5.

END OF ABSTRACT

A. CONDITION PRIOR TO EVENT

MODE 1 - Power Operation RX Power 100% RCS AB! Temperature/ Pressure 559 F/2235 psig

B. DESCRIPTION OF EVENT

On July 7, 1993, at 0851, Zion Unit 1 Reactor tripped from 100% power operation, The Reactor Trip signal originated from an invalid Loop Stop Isolation Valve (LSIV) closure signal, which caused the 1B Reactor Coolant Pump (RCP)A! Breaker to trip open, The loss of this RCP initiated the Reactor Trip in accordance with Reactor Protection trip logic.

The invalid LSIV closure signal was initiated during Periodic Testing (PT)-5, Section 12 of train A Reactor Protection circuitry. A verification of the affected circuitry revealed that a train B LSIV (1MOV-RC8001D) closure signal was present, even though the test switch for this valve was in the normal (open) position and the valve was deenergized open. This provided the train B portion of the logic for a simulated LSIV close signal, Both train A and train B are required for the RCP to trip. When Step K of PT-5, Section 12, was performed, the train A portion of the LSIV close signal for 1MOV-RC8001D was generated, satisfying the trip logic and causing the 1B RCP breaker to trip open.

It should be noted that the relay that actuated for an LSIV closure can only be energized from two sources on train B. One source is an actual valve closure that actuates the stem mounted close limit switch, and the other source is depressing the Reactor Protection test panel pushbutton. The train A closure signal is provided by the LSIV's internal gear driven limit switch.

It should also be noted that LSIV 1MOV-RC8001D was never closed, but that a simulated closed signal was initiated from the reactor protection test panels. Under normal circumstances, the two trains of Reactor Protection are tested separately. However, the fault in the train B circuitry, coincident with the performance of the train A testing, allowed the logic to occur.

C. APPARENT CAUSE OF EVENT

The cause of the Unit 1 Reactor Trip was component failure. Troubleshooting identified that the stem mounted limit switch for LSIV 1MOV-RC8001D had a shorted lug on the limit switch contact. The shorted lug occurred because the cables used in this limit switch housing are thick and the housing is small, It appears that the two cables for closed valve indication were pressed together and bent over to fit in the housing. The combination of high temperature and vibration caused the lug from one cable to wear away the insulation on the other cable, causing a short. This shorted lug erroneously energized the closure relay (33XB/8001D) for the train B LSIV, 1MOV-RC 8001D. When the train A relay (33XA/8001D) was tested, the coincident logic resulted in the opening of the 1B RCP breaker, and subsequently in the Unit 1 Reactor Trip.

Troubleshooting also identified that the Loop C Cold Leg LSIV, 1MOV-RC8002B, relay (33XB/8002B) was energized. This relay was erroneously energized because of corrosion build-up on a closed position limit switch contact due to moisture that penetrated the limit switch housing.

D. SAFETY ANALYSIS OF EVENT

Zion Station is designed to withstand such a plant transient and adequate procedures are in place to stabilize the plant following a Reactor Trip.

Since the plant was placed in a stable and safe condition following the reactor trip, and no equipment important to the safe shutdown of the plant was damaged by this event, this Reactor Trip has no impact on the health and safety of the public.

E. CORRECTIVE ACTIONS

1. The shorted lug on the 1MOV-RC8001D limit switch was repaired. This caused the downstream relay (33XB/8001D)to de-energize and the circuit to return to normal.

2. The 1MOV-RC8002B limit switch housing was dried out, and cleaned. The downstream relay (33XB/8002B) de-energized, and the circuit returned to normal.

3. The System Engineers have verified the state of each LSIV relay in Reactor Protection and Safeguards cabinets for both units All relays were found in the correct state.

4. PT-5 was successfully repeated to verify that the corrective actions taken were sufficient to eliminate the problems identified.

5. The Electrical Maintenance Department and the Site Engineering and Construction Department will review the work practices associated with installing wires in housings that may be cramped. (295-180-93-00801)

6. The Zion Site Support Engineering Group will perform a root cause evaluation on the design of limit switch housings and the associated wiring. (295-180-93-00802)

7. The Zion Site Design Engineering Group will review the design basis for the RCP protection logic to determine if it is necessary to continue testing this logic. (295-180-93-00803)

8. The Zion Site Design Engineering Group will examine the feasibility of modifying the RC protection logic to include indication so that failed limit switches or pushbuttons can be promptly identified. (295-180-93-00804)

9. The Zion Site Support Engineering Group will address the reliability of the limit switches currently used on the LSIV's and determine if changes are required. (295-180-93-00805)

10. The Zion Site Support Engineering Group will review the industry experience with the limit switches involved. (295-180-93-00806)

11. The Zion Site Support Engineering Group will provide a cost and scope estimate for reviewing all testing associated with the Reactor Protection System, to determine what testing can be eliminated without plant modifications. (295-180-93-00807)

12. The Zion Site Support Engineering Group will evaluate the feasibility of replacing the existing cables used on the LSIV limit switches, between the switch and the junction box, with a thinner cable, or using a larger housing for these cables. (295-180-93-00808)

13. The System Engineering staff will verify relay states for LSIV/RCP protection logic relays prior to each PT-5, unless some other means is identified to prevent recurrence of this problem, (295-180-93-00809)

14. The System Engineer will review PT-5 and PT-10, to identify other protection logic that could fail and not be detected by operating personnel. (295-180-93-00810)

15. The System Engineering Staff will evaluate the current testing requirements for the LSIV/RCP protection logic and determine if testing can be discontinued, done less frequently, or done in a different way that would prevent recurrence of this event. (295-180-93-00811)

F. PREVIOUS EVENTS

A search of the root cause database was conducted using the keywords reactor trip, reactor protection system, limit switch, PT-5, and LSIVs. No similar events were found.

G. COMPONENT FAILURE DATA

Manufacturer Nomenclature

NAMCO Controls Limitswitch

93007.ler3

ATTACHMENT 1 TO 9308090225 PAGE 1 OF 1

Commonwealth Edison
Zion Generating Station
101 Shiloh Blvd.
Zion, Illinois 60099
Telephone 708 / 746-2084

August 3, 1993

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

The enclosed Licensee Event Report number 93-007-00. Docket No.

50-295/DPR-39 from Zion Generating Station is being transmitted to you in accordance with the requirements of 10CFR50.73(a)(2)(iv), which requires a 30 day written report when any event or condition occurs that resulted in a manual or automatic actuation of any Engineered Safety Feature, including the Reactor Protection System.

Very truly yours,

T. P. Joyce
Station Manager
Zion Generating Station

TPJ/dmm

Enclosure: Licensee Event Report

cc: NRC Region III Administrator
NRC Resident Inspector
INPO Record Center
CECo distribution List

93007.ler5

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